Attendance Problems. Solve each proportion.

1. $\frac{12}{15} = \frac{AB}{20}$

2. $\frac{9.5}{QR} = \frac{3.8}{4.2}$

3. $\frac{x-5}{20} = \frac{x+3}{30}$

4. $\frac{y+7}{2y-4} = \frac{3.5}{2.8}$

- I can use properties of similar triangles to find segment lengths.
- I can apply proportionality and triangle angle bisector theorems.

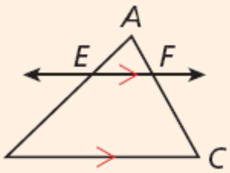
Common Core

CC.9-12.G.SRT.5 Use congruence and similarity criteria for triangles to solve problems and prove relationships in geometric figures.
CC.9-12.G.SRT.4 Prove theorems about triangles.
CC.9-12.G.SRT.2 Given two figures, use the definition of similarity in terms of similarity transformations to decide if they are similar; explain using similarity transformations the meaning of similarity for triangles as the equality of all corresponding angles and the proportionality of all corresponding pairs of sides.

Q: What do you call two L's?
A: A parallel

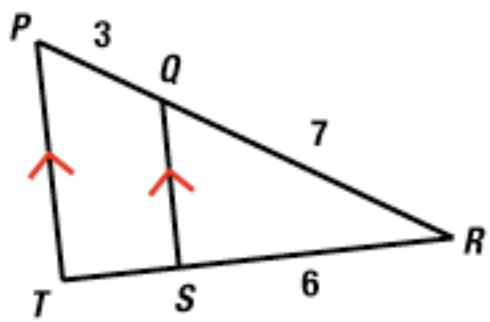
"If I am through learning, I am through."
Basketball Coach, John Wooden

Theorem 7-4-1 **Triangle Proportionality Theorem**

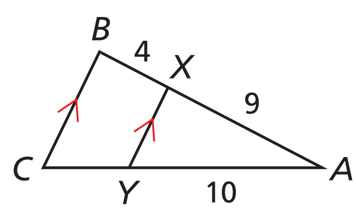
THEOREM	HYPOTHESIS	CONCLUSION
If a line parallel to a side of a triangle intersects the other two sides, then it divides those sides proportionally.	 $\overline{EF} \parallel \overline{BC}$	$\frac{AE}{EB} = \frac{AF}{FC}$

Refer to video example 1.

Find *TS*.



1 Finding the Length of a Segment



Find *CY*.

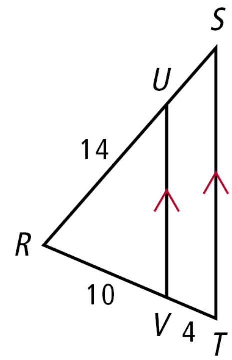
It is given that $\overline{XY} \parallel \overline{BC}$, so $\frac{AX}{XB} = \frac{AY}{YC}$ by the Triangle Proportionality Theorem.

$\frac{9}{4} = \frac{10}{CY}$ *Substitute 9 for AX, 4 for XB, and 10 for AY.*

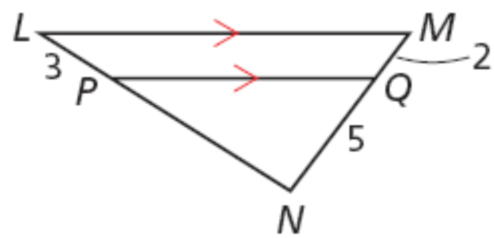
$9(CY) = 40$ *Cross Products Prop.*

$CY = \frac{40}{9}$, or $4\frac{4}{9}$ *Divide both sides by 9.*

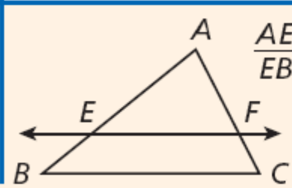
Exaple 1. Find US.



5. <u>Guided Practice</u>. Find PN.

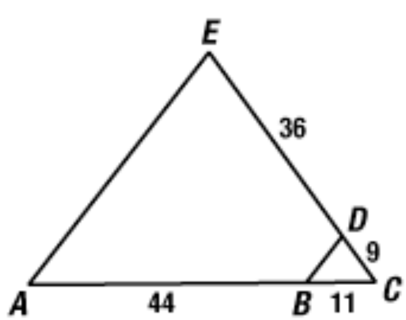


Theorem 7-4-2 Converse of the Triangle Proportionality Theorem

THEOREM	HYPOTHESIS	CONCLUSION
If a line divides two sides of a triangle proportionally, then it is parallel to the third side.	 $\frac{AE}{EB} = \frac{AF}{FC}$	$\overleftrightarrow{EF} \parallel \overline{BC}$

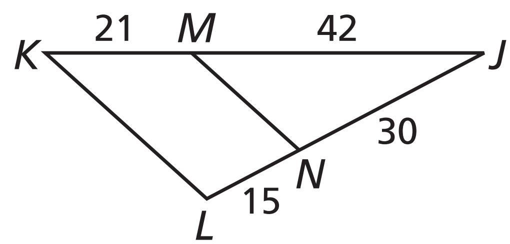
<u>Refer to video example 2</u>.

Verify that $\overline{AE} \parallel \overline{BD}$.



2 Verifying Segments are Parallel

Verify that $\overline{MN} \parallel \overline{KL}$.

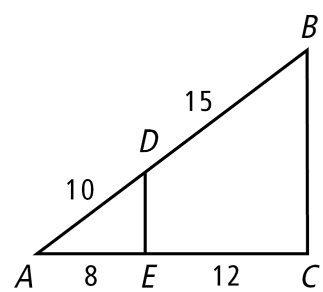


$$\frac{JM}{MK} = \frac{42}{21} = 2$$

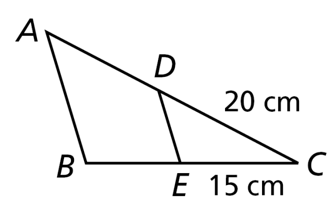
$$\frac{JN}{NL} = \frac{30}{15} = 2$$

Since $\frac{JM}{MK} = \frac{JN}{NL}$, $\overline{MN} \parallel \overline{KL}$ by the Converse of the Triangle Proportionality Theorem.

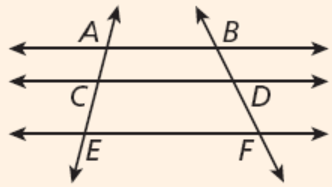
Example 2. Verify that $\overline{DE} \parallel \overline{BC}$.



6. Guided Practice. $AC = 36$ cm, and $BC = 27$ cm. Verify that $\overline{DE} \parallel \overline{AB}$.

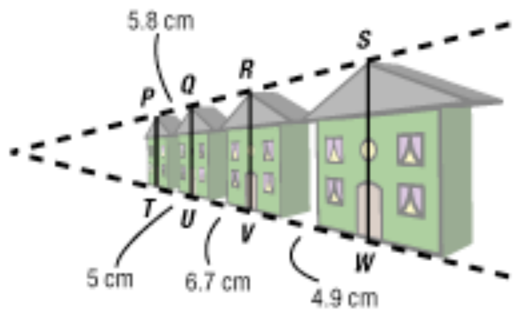


Corollary 7-4-3 **Two-Transversal Proportionality**

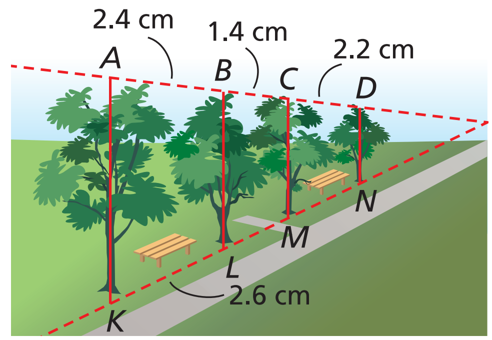
THEOREM	HYPOTHESIS	CONCLUSION
If three or more parallel lines intersect two transversals, then they divide the transversals proportionally.		$\frac{AC}{CE} = \frac{BD}{DF}$

Refer to video example 3.

An artist used perspective to draw guidelines to help her sketch a row of parallel houses. She then checked the drawing by measuring the distances between the houses. What is *QS*?



3 Art Application



An artist used perspective to draw guidelines to help her sketch a row of parallel trees. She then checked the drawing by measuring the distances between the trees. What is *LN*?

$\overline{AK} \parallel \overline{BL} \parallel \overline{CM} \parallel \overline{DN}$ — *Given*

$\frac{KL}{LN} = \frac{AB}{BD}$ — *2-Transv. Proportionality Corollary*

$BD = BC + CD$ — *Seg. Add. Post.*

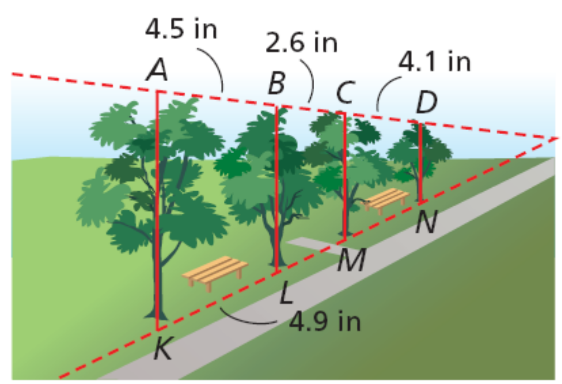
$BD = 1.4 + 2.2 = 3.6$ cm — *Substitute 1.4 for BC and 2.2 for CD.*

$\frac{2.6}{LN} = \frac{2.4}{3.6}$ — *Substitute the given values.*

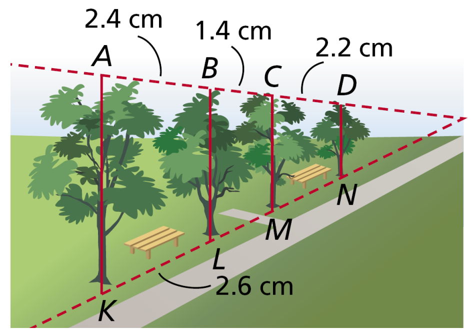
$2.4(LN) = 3.6(2.6)$ — *Cross Products Prop.*

$LN = 3.9$ cm — *Divide both sides by 2.4.*

Example 3. Suppose that an artist decided to make a larger sketch of the trees. In the figure, if $AB = 4.5$ in., $BC = 2.6$ in., $CD = 4.1$ in., and $KL = 4.9$ in., find LM and MN to the nearest tenth of an inch.

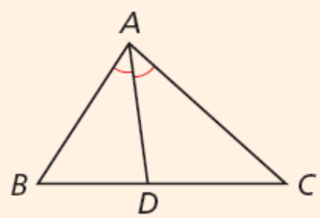


7. <u>Guided Practice</u>. Use the diagram to find *LM* and *MN* to the nearest tenth.



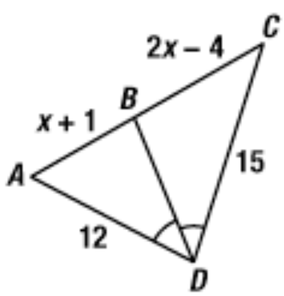
7-4 Applying Properties of Similar Triangles *(p 499)* 8-12.

Theorem 7-4-4 Triangle Angle Bisector Theorem

THEOREM	HYPOTHESIS	CONCLUSION
An angle bisector of a triangle divides the opposite side into two segments whose lengths are proportional to the lengths of the other two sides. ($\triangle \angle$ Bisector Thm.)		$\frac{BD}{DC} = \frac{AB}{AC}$

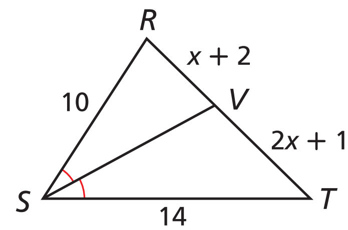
<u>Refer to video example 4</u>.

Find *AB* and *BC*.



4 Using the Triangle Angle Bisector Theorem

Find RV and VT.



$\frac{RV}{VT} = \frac{SR}{ST}$ by the $\triangle \angle$ Bisector Thm.

$\frac{x+2}{2x+1} = \frac{10}{14}$ *Substitute the given values.*

$14(x+2) = 10(2x+1)$ *Cross Products Prop.*

$14x + 28 = 20x + 10$ *Dist. Prop.*

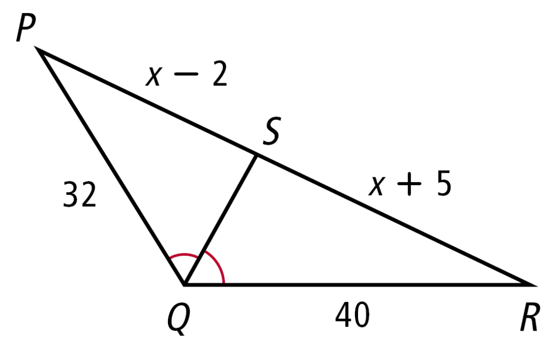
$18 = 6x$ *Simplify.*

$x = 3$ *Divide both sides by 6.*

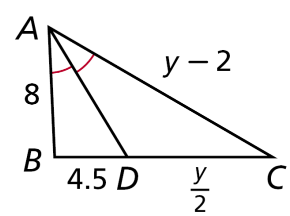
$RV = x + 2$ $\quad$ $VT = 2x + 1$ *Substitute 3 for x.*

$= 3 + 2 = 5$ $\quad$ $= 2(3) + 1 = 7$

<u>Example 4</u>. Find PS & SR.



8. <u>Guided Practice</u>. Find AC and DC.



7-4 Applying Properties of Similar Triangles *(p 499)* 8-14, 16, 18, 19-22, 26, 28-30.